

## Chapter 4 Multiple Choice Review

- Which of these compounds is a strong electrolyte?
  - H<sub>2</sub>O
  - N<sub>2</sub>
  - CH<sub>3</sub>COOH (acetic acid)
  - C<sub>2</sub>H<sub>6</sub>O (ethanol)
  - KOH
- Which of these compounds is a weak electrolyte?
  - HCl
  - CH<sub>3</sub>COOH (acetic acid)
  - C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> (glucose)
  - O<sub>2</sub>
  - NaCl
- Identify the major ionic species present in an aqueous solution of Na<sub>2</sub>CO<sub>3</sub>.
  - Na<sub>2</sub><sup>+</sup>, CO<sub>3</sub><sup>2-</sup>
  - Na<sub>2</sub><sup>+</sup>, C<sup>2-</sup>, O<sub>3</sub>
  - Na<sup>+</sup>, C<sup>4+</sup>, O<sub>3</sub><sup>2-</sup>
  - Na<sup>+</sup>, C<sup>+</sup>, O<sup>2-</sup>
  - Na<sup>+</sup>, CO<sub>3</sub><sup>2-</sup>
- The distinguishing characteristic of all electrolyte solutions is that they
  - contain molecules.
  - conduct electricity.
  - react with other solutions.
  - always contain acids.
  - conduct heat.
- Based on the solubility rules, which one of these compounds should be insoluble in water?
  - Na<sub>2</sub>SO<sub>4</sub>
  - BaSO<sub>4</sub>
  - CuSO<sub>4</sub>
  - MgSO<sub>4</sub>
  - Rb<sub>2</sub>SO<sub>4</sub>
- Based on the solubility rules, which one of these compounds should be soluble in water?
  - Hg<sub>2</sub>Cl<sub>2</sub>
  - Na<sub>2</sub>S
  - Ag<sub>2</sub>CO<sub>3</sub>
  - Ag<sub>2</sub>S
  - BaSO<sub>4</sub>
- Which of these choices is the correct net ionic equation for the reaction that occurs when solutions of Pb(NO<sub>3</sub>)<sub>2</sub> and NH<sub>4</sub>Cl are mixed?
  - $\text{Pb}(\text{NO}_3)_2(\text{aq}) + 2\text{NH}_4\text{Cl}(\text{aq}) \rightarrow \text{NH}_4\text{NO}_3(\text{aq}) + \text{PbCl}_2(\text{s})$
  - $\text{Pb}^{2+}(\text{aq}) + 2\text{Cl}^{-}(\text{aq}) \rightarrow \text{PbCl}_2(\text{s})$
  - $\text{Pb}^{2+}(\text{aq}) + 2\text{NO}_3^{-}(\text{aq}) + 2\text{NH}_4^{+}(\text{aq}) + 2\text{Cl}^{-}(\text{aq}) \rightarrow 2\text{NH}_4^{+}(\text{aq}) + 2\text{NO}_3^{-}(\text{aq}) + \text{PbCl}_2(\text{s})$
  - $\text{NH}_4^{+}(\text{aq}) + \text{NO}_3^{-}(\text{aq}) \rightarrow 2\text{NH}_4\text{NO}_3(\text{s})$
  - No reaction occurs.
- What is the chemical formula of the salt produced by the neutralization of hydrobromic acid with magnesium hydroxide?
  - MgBr
  - Mg<sub>2</sub>Br<sub>3</sub>
  - Mg<sub>3</sub>Br<sub>2</sub>
  - Mg<sub>2</sub>Br
  - MgBr<sub>2</sub>
- What is the chemical formula of the salt produced by the neutralization of potassium hydroxide with sulfuric acid?
  - KSO<sub>3</sub>
  - K<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>
  - K<sub>2</sub>SO<sub>4</sub>
  - K(SO<sub>4</sub>)<sub>2</sub>
  - KSO<sub>4</sub>
- The oxidation number of S in K<sub>2</sub>SO<sub>4</sub> is
  - +6.
  - +4.
  - +2.
  - 1.
  - none of these.
- The highest possible oxidation number of nitrogen is
  - +8.
  - +5.
  - +3.
  - +1.
  - 3.
- Which of these equations does not represent an oxidation–reduction reaction?
  - $3\text{Al} + 6\text{HCl} \rightarrow 3\text{H}_2 + 4\text{AlCl}_3$
  - $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$
  - $2\text{NaCl} + \text{Pb}(\text{NO}_3)_2 \rightarrow \text{PbCl}_2 + 3\text{NaNO}_3$
  - $2\text{NaI} + \text{Br}_2 \rightarrow 2\text{NaBr} + \text{I}_2$
  - $\text{Cu}(\text{NO}_3)_2 + \text{Zn} \rightarrow \text{Zn}(\text{NO}_3)_2 + \text{Cu}$
- In the chemical reaction  $5\text{H}_2\text{O}_2 + 2\text{MnO}_4^{-} + 6\text{H}^{+} \rightarrow 2\text{Mn}^{2+} + 8\text{H}_2\text{O} + 5\text{O}_2$ , the oxidizing agent is
  - H<sub>2</sub>O<sub>2</sub>.
  - MnO<sub>4</sub><sup>-</sup>.
  - H<sup>+</sup>.
  - Mn<sup>2+</sup>.
  - O<sub>2</sub>.

14. Identify the reducing agent in the chemical reaction  

$$5\text{Fe}^{2+}(\text{aq}) + \text{MnO}_4^{-}(\text{aq}) + 8\text{H}^{+}(\text{aq}) \rightarrow 5\text{Fe}^{3+}(\text{aq}) + \text{Mn}^{2+}(\text{aq}) + 4\text{H}_2\text{O}(\text{l}).$$
 A.  $\text{Fe}^{2+}$   
 B.  $\text{MnO}_4^{-}$   
 C.  $\text{H}^{+}$   
 D.  $\text{Mn}^{2+}$   
 E.  $\text{Fe}^{3+}$
15. Predict the products of the single replacement reaction  

$$\text{Fe}(\text{s}) + \text{CuSO}_4(\text{aq}) \rightarrow ?$$
 A.  $\text{Cu}(\text{s}) + \text{FeSO}_4(\text{aq})$   
 B.  $\text{Fe}(\text{s}) + \text{Cu}(\text{s}) + \text{SO}_4(\text{aq})$   
 C.  $\text{CuS}(\text{s}) + \text{Fe}_2\text{SO}_4(\text{aq})$   
 D.  $\text{FeCuSO}_4(\text{aq})$   
 E.  $\text{FeO}(\text{s}) + \text{CuSO}_3(\text{aq})$
16. Which of these chemical equations describes a hydrogen displacement reaction?  
 A.  $2\text{C}_2\text{H}_6(\text{g}) + 7\text{O}_2(\text{g}) \rightarrow 4\text{CO}_2(\text{g}) + 6\text{H}_2\text{O}(\text{l})$   
 B.  $2\text{KBr}(\text{aq}) + \text{Cl}_2(\text{g}) \rightarrow 2\text{KCl}(\text{aq}) + \text{Br}_2(\text{l})$   
 C.  $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$   
 D.  $\text{CaBr}_2(\text{aq}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{CaSO}_4(\text{s}) + 2\text{HBr}(\text{g})$   
 E.  $2\text{Al}(\text{s}) + 3\text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{Al}_2(\text{SO}_4)_3(\text{aq}) + 3\text{H}_2(\text{g})$
17. 25.0 mL of a 0.2450 M  $\text{NH}_4\text{Cl}$  solution is added to 55.5 mL of 0.1655 M  $\text{FeCl}_3$ . What is the concentration of chloride ion in the final solution?  
 A. 0.607 M  
 B. 0.418 M  
 C. 1.35 M  
 D. 0.190 M  
 E. 0.276 M
18. When 50.0 mL of a 0.3000 M  $\text{AgNO}_3$  solution is added to 50.0 mL of a solution of  $\text{MgCl}_2$ , an  $\text{AgCl}$  precipitate forms immediately. The precipitate is then filtered from the solution, dried, and weighed. If the recovered  $\text{AgCl}$  is found to have a mass of 0.1183 g, what was the concentration of magnesium ions in the original  $\text{MgCl}_2$  solution?  
 A. 0.300 M      B.  $8.25 \times 10^{-3}$  M      C.  $1.65 \times 10^{-2}$  M      D.  $2.06 \times 10^{-5}$  M      E.  $4.13 \times 10^{-3}$  M
19. One method of determining the concentration of hydrogen peroxide ( $\text{H}_2\text{O}_2$ ) in a solution is through titration with iodide ion. The net ionic equation for this reaction is  

$$\text{H}_2\text{O}_2 + 2\text{I}^{-} + 2\text{H}^{+} \rightarrow \text{I}_2 + 2\text{H}_2\text{O}$$
 A 50.00 mL sample of a hydrogen peroxide solution is found to react completely with 37.12 mL of a 0.1500 M KI solution. What is the concentration of hydrogen peroxide in the sample?  
 A.  $5.568 \times 10^{-2}$  M      B. 0.2227 M      C. 0.1010 M      D. 0.4041 M      E. 0.1114 M
20. Zinc dissolves in hydrochloric acid to yield hydrogen gas:  

$$\text{Zn}(\text{s}) + 2\text{HCl}(\text{aq}) \rightarrow \text{ZnCl}_2(\text{aq}) + \text{H}_2(\text{g})$$
 When a 12.7 g chunk of zinc dissolves in 500. mL of 1.450 M HCl, what is the concentration of hydrogen ions remaining in the final solution?  
 A. 0.776 M      B. 0.388 M      C. 0.674 M      D. 1.06 M      E. 0 M